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IN THE CLAIMS

1. (Currently Amended) A catalyst performance diagnostics system, comprising:
 - a plurality of treatment devices, wherein at least two treatment devices comprise a nitrogen oxides adsorber material;
 - a plurality of gas sensors disposed in fluid communication with said plurality of treatment devices; and
 - an on-board diagnostic system coupled to said plurality of gas sensors.
2. (Cancelled)
3. (Cancelled)
4. (Currently Amended) The catalyst performance diagnostics system of Claim 1, wherein said plurality of gas sensors further comprising an upstream gas sensor disposed before said plurality of treatment devices.
5. (Currently Amended) The catalyst performance diagnostics system of Claim 1, wherein said plurality of gas sensors further comprising a downstream gas sensor disposed after said plurality of treatment devices.
6. (Currently Amended) The catalyst performance diagnostics system of Claim 1, wherein said plurality of treatment devices further comprising an upstream treatment device and a downstream treatment device, and wherein said plurality of gas sensors comprise a between gas sensor disposed between said upstream treatment device and said downstream treatment device plurality of treatment devices.

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7. (Currently Amended) The catalyst performance diagnostics system of Claim 1, wherein said plurality of gas sensors further comprising a gas sensor disposed within a treatment device of said plurality of treatment devices.

8. (Currently Amended) The catalyst performance diagnostics system of Claim 1, wherein said plurality of exhaust treatment devices comprise a first treatment device, a second treatment device, and a third treatment device, and wherein said plurality of gas sensors comprise further comprising a first gas sensor disposed before said first treatment device, a second gas sensor disposed between said second treatment device and said third treatment device, and a third gas sensor disposed after said third treatment device.

9. (Cancelled)

10. (Currently Amended) A method for monitoring catalyst performance, comprising:

introducing an exhaust gas stream into an exhaust system;
monitoring said exhaust gas stream using a plurality of gas sensors;
passing said exhaust gas stream through a plurality of treatment devices, wherein at least two treatment devices comprise a nitrogen oxides adsorber material;
measuring a response time differential between said plurality of gas sensors; and
desulfating said treatment devices.

11. (Original) The method of Claim 10, further comprising monitoring said plurality of gas sensors using an on-board diagnostic system.

12. (Original) The method of Claim 10, wherein said desulfating further comprises adjusting an air to fuel ratio to regenerate a catalyst material of one or more of said treatment devices.

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13. (Original) The method of Claim 10, wherein said measuring further comprises collecting a plurality of responses by an on-board diagnostic system, wherein said responses further comprise a response time differential between a first gas sensor and a second gas sensor, a response time differential between said second gas sensor and a third gas sensor, and a response time differential between said first gas sensor and said third gas sensor.

14. (Original) The method of Claim 10, further comprising calculating a sulfur contamination index based upon said response time differentials between said plurality of gas sensors.

15. (Currently Amended) The method of Claim 14, wherein said measuring further comprises measuring said response time differentials between said plurality of gas sensors to calculate a sulfur contamination index.

16. (Original) The method of Claim 14, wherein said three sulfur contamination indices further comprise a first sulfur contamination index based on a first gas sensor and a third gas sensor, a second sulfur contamination index based on a second sensor and said third sensor, and a third contamination index based on said first sensor and said second sensor.

17. (Original) The method of Claim 10, further comprising measuring a nitrogen oxide storage capacity of one or more of said treatment devices.

18. (Original) The method of Claim 17, further comprising determining a nitrogen oxide conversion efficiency of said one or more treatment devices.

19. (Original) The method of Claim 18, further comprising using said nitrogen oxide conversion efficiency of said one or more treatment devices to determine whether said treatment devices are experiencing sulfur poisoning.

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20. (Currently Amended) A method for monitoring and treating emissions breakthrough in an exhaust system, comprising:

introducing an exhaust gas stream into an exhaust system;
passing said exhaust gas stream through a plurality of treatment devices;
passing said exhaust gas stream through a plurality of gas sensors;
monitoring said exhaust gas stream using a said plurality of gas sensors;
adjusting an air to fuel ratio;
detecting an emissions breakthrough;
adjusting said air to fuel ratio; and
catalytically treating said emissions breakthrough using said treatment devices.

21. (Original) The method of Claim 20, wherein said detecting further comprises detecting a rich air to fuel ratio passing through a treatment device.

22. (Original) The method of Claim 20, wherein said monitoring further comprises measuring a response time differential between at least two sensors.

23. (Original) The method of Claim 22, wherein said measuring further comprises detecting an adjustment in said air to fuel ratio of said exhaust gas stream.

24. (Original) The method of Claim 22, wherein said detection further comprises adjusting said air to fuel ratio from a lean air to fuel ratio or stoichiometric air to fuel ratio to a rich air to fuel ratio.

25. (Original) The method of Claim 22, wherein said detecting further comprises detecting carbon monoxide.

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26. (New) A catalyst performance diagnostics system, comprising:
a plurality of treatment devices, wherein said plurality comprises a first treatment device, a second treatment device, and a third treatment device;

a plurality of gas sensors disposed in fluid communication with said plurality of treatment devices, wherein said plurality of gas sensors comprise a first gas sensor disposed before said first treatment device, a second gas sensor disposed between said second treatment device and said third treatment device, and a third gas sensor disposed after said third treatment device; and

an on-board diagnostic system coupled to said plurality of gas sensors.

27. (New) The catalyst performance diagnostics system of Claim 26, wherein at least one of said first sensor, said second sensor, and said third gas sensor is a NO_x sensor.

28. (New) The catalyst performance diagnostics system of Claim 27, wherein said first and said second gas sensors are stoichiometric switch sensors.

29. (New) The catalyst performance diagnostics system of Claim 27, wherein said third gas sensor is a NO_x sensor.

30. (New) The catalyst performance diagnostics system of Claim 4, wherein said plurality of treatment devices comprise a particulate matter filter or an exhaust treatment device comprising a nitrogen oxides adsorber material disposed after said upstream gas sensor and disposed before another exhaust treatment device of said plurality of treatment devices.

31. (New) The catalyst performance diagnostics system of Claim 30, wherein said plurality of gas sensors comprises a downstream gas sensor disposed after said at least two treatment devices.